

Original Claims

1. Device for use in sports and games for detecting the position of impact of a moveable object, such as a ball,
5 in particular tennis ball, baseball or the like, comprising a sheet or mat (1,10) with an outer (2) and an inner (8) layer, the sheet or mat (1,10) forming a target surface and having embedded therein a plurality of electrically conductive elements (12A,13A;12B,13B)
10 forming pressure sensitive switches distributed over the target surface and communicating with electronic circuitries (33) for outputting, processing and displaying (35) electrical signals from pressure sensitive switches (12A,13A;12B,13B) when activated by
15 said impact or pressure, wherein
 - the underneath side of the outer layer (2) of the sheet or mat (1,10) is provided with a first pattern of electrically conductive elements (13A;12B) at least at the desired positions of the pressure sensitive switches,
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 - the upper side of the inner layer (8) of said sheet or mat (1,10) is provided with a second pattern of electrically conductive elements (12A;13B) at least at the desired positions of the pressure sensitive switches,
 - the first pattern of electrically conductive elements (13A;12B) and the second pattern of electrically conductive elements (12A;13B) are arranged or placed in such a way that they will work together or cooperate with each other, and
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 - at least one of the first and second patterns of electrically conductive elements (12A,13A;12B,13B), is subdivided into a number of individual zones (A,B,C,D..., X,Y,Z...), where each zone comprises a plurality of pressure sensitive switches (12A,13A;12B,13B), and the electronic circuitries (33) have separate connections (30A,30B) to each of said individual zones.
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2. Device according to claim 1, further comprising an isolation layer (5) with openings at least at the positions or areas of the pressure sensitive switches (12A, 13A; 12B, 13B), said isolation layer (5) separating the outer (2) and the inner layer and serving as an intermediate layer between said layers, wherein the character and/or the thickness of the isolation layer (5) determine(s) the detection sensitivity.

10 3. Device according to claim 1, further comprising an isolation layer (5) having a special design, wherein the desired contact areas of the mat (1,10) are partially surrounded by the isolation (5) which has at least one opening (51) sideways in relation to said two layers on each side of the isolation layer (5) and allowing the air between said layers in the desired contact areas to be able to be pressed or pushed out from said areas through the opening(s) (51) under impact or strong pressure (23), so that contact is established between the conducting elements on the outer layer and the conducting elements on the inner layer.

15 4. Device according to claim 1, further comprising an isolation layer (5) having a special design, wherein the isolation layer (5) has one or several portions in said contact areas, so that contact between the conducting elements on the outer layer and the conducting elements on the inner layer can be established only by impact or strong pressure (23).

20 30 5. Device according to any one of claims 1-4, wherein the second pattern of electrically conductive elements (12A; 13B) is applied on the upward surface of an inner support layer (3) joined with the inner layer (8).

6. Device according to any one of claims 1-5, intended for use with a moveable object in the form of a ball having a given size, wherein said positions of the pressure sensitive switches (12A, 13A; 12B, 13B) are 5 mutually spaced in such a way that the ball or the object by impact or pressure will activate at least two pressure sensitive switches (12A; 12B).

7. Device according to any one of claims 1-6, wherein 10 said first and/or said second pattern of electrically conductive elements (12A, 13A; 12B, 13B; 13A', 13A"; 13B', 13B") are/is formed by printed circuit elements.

8. Device according to any one of claims 1-7, wherein 15 the outer layer (2) of the sheet or mat (1, 10) is further provided with a hollow and flexible, dome-shaped protrusion (2A) at each position of the pressure sensitive switches (12B, 13B), each zone comprising a number of protrusions (2A).

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9. Device according to claim 8, wherein said hollow and flexible protrusions (2A) inherently provides for a sufficient degree of elastic deformation when activated by said impact or pressure, which also affects the degree 25 of detection accuracy.

10. Device according to claim 8 or 9, wherein said hollow and flexible protrusions (22A) are further provided with spring elements (25), preferably of metal, 30 for obtaining a sufficient degree of elastic deformation when activated by said impact or pressure.

11. Device according to any one of claims 8-10, wherein the shape of said protrusions (2A, 10A, 10B, 10C...) is 35 substantially circular as seen in plan view.

12. Device according to any one of claims 1-11, wherein

the surface of the sheet or mat (1,10) is provided with at least one line (11X) corresponding to a line (11) that is to be found on a standard field or court for the sport or game concerned, where at least some of the zones (10p) border said at least one line (11X).

13. Device according to claim 12, wherein said at least one line (11X), located or provided on said surface, contains line zones (20p) having pressure sensitive switches, preferably with said line zones arranged in the longitudinal direction of said at least one line (11X).

AMENDED CLAIMS

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original claims 1-13 replaced by amended claims 1-13]

1. Device for use in sports and games for detecting the position of impact of a moveable object, such as a ball, in particular tennis ball, baseball or the like, comprising a sheet or mat (1,10) with an outer (2) and an inner (8) layer, the sheet or mat (1,10) forming a target surface and having embedded therein a plurality of electrically conductive elements (12A,13A;12B,13B) forming pressure sensitive switches distributed over the target surface and communicating with electronic circuitries (33) for outputting, processing and displaying (35) electrical signals from pressure sensitive switches (12A,13A;12B,13B) when activated by said impact or pressure,
10 characterized in that:
 - the underneath side of the outer layer (2) of the sheet or mat (1,10) is provided with a first pattern of electrically conductive elements (13A;12B) at least at the desired positions of the pressure sensitive switches,
 - the upper side of the inner layer (8) of said sheet or mat (1,10) is provided with a second pattern of electrically conductive elements (12A;13B) at least at the desired positions of the pressure sensitive switches,
 - the first pattern of electrically conductive elements (13A;12B) and the second pattern of electrically conductive elements (12A;13B) are arranged or placed in such a way that they will work together or cooperate with each other, and
 - at least one of the first and second patterns of electrically conductive elements (12A,13A;12B,13B), is subdivided into a number of individual zones (A,B,C,D..., X,Y,Z...), where each zone comprises a plurality of pressure sensitive switches (12A,13A;12B,13B), and the electronic circuitries (33) have separate connections (30A,30B) to each of said individual zones.
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2. Device according to claim 1, further comprising an isolation layer (5) with openings at least at the positions or areas of the pressure sensitive switches (12A,13A;12B,13B), said isolation layer (5) separating the outer (2) and the inner layer and serving as an intermediate layer between said layers, wherein the character and/or the thickness of the isolation layer (5) determine(s) the detection sensitivity.

10 3. Device according to claim 1, further comprising an isolation layer (5) having a special design, wherein the desired contact areas of the mat (1,10) are partially surrounded by the isolation (5) which has at least one opening (51) sideways in relation to said two layers on each side of the isolation layer (5) and allowing the air between said layers in the desired contact areas to be able to be pressed or pushed out from said areas through the opening(s) (51) under impact or strong pressure (23), so that contact is established between the conducting elements on the outer layer and the conducting elements on the inner layer.

15 4. Device according to claim 1, further comprising an isolation layer (5) having a special design, wherein the isolation layer (5) has one or several portions in said contact areas, so that contact between the conducting elements on the outer layer and the conducting elements on the inner layer can be established only by impact or strong pressure (23).

20 30 5. Device according to any one of claims 1-4, wherein the second pattern of electrically conductive elements (12A;13B) is applied on the upward surface of an inner support layer (3) joined with the inner layer (8).

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6. Device according to any one of claims 1-5, intended for use with a moveable object in the form of a ball having a given size, wherein said positions of the pressure sensitive switches (12A,13A;12B,13B) are mutually spaced in such a way that the ball or the object by impact or pressure will activate at least two pressure sensitive switches (12A;12B).

7. Device according to any one of claims 1-6, wherein said first and/or said second pattern of electrically conductive elements (12A,13A;12B,13B;13A',13A";13B',13B") are/is formed by printed circuit elements.

8. Device according to any one of claims 1-7, wherein the outer layer (2) of the sheet or mat (1,10) is further provided with a hollow and flexible, dome-shaped protrusion (2A) at each position of the pressure sensitive switches (12B,13B), each zone comprising a number of protrusions (2A).

9. Device according to claim 8, wherein said hollow and flexible protrusions (2A) inherently provides for a sufficient degree of elastic deformation when activated by said impact or pressure, which also affects the degree of detection accuracy.

10. Device according to claim 8 or 9, wherein said hollow and flexible protrusions (22A) are further provided with spring elements (25), preferably of metal, for obtaining a sufficient degree of elastic deformation when activated by said impact or pressure.

11. Device according to any one of claims 8-10, wherein the shape of said protrusions (2A,10A,10B,10C...) is substantially circular as seen in plan view.

12. Device according to any one of claims 1-11, wherein
the surface of the sheet or mat (1,10) is provided with at
least one line (11X) corresponding to a line (11) that is
to be found on a standard field or court for the sport or
5 game concerned, where at least some of the zones (10p)
border said at least one line (11X).

13. Device according to claim 12, wherein said at least
one line (11X), located or provided on said surface,
10 contains line zones (20p) having pressure sensitive
switches, preferably with said line zones arranged in the
longitudinal direction of said at least one line (11X).